RIVER RESTORATION MEASURES IN FOUR SECONDARY CHANNELS OF THE MISSISSIPPI RIVER, AN INTERAGENCY SUCCESS STORY

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Abstract A combined engineering/biological effort between several state and federal agencies resulted in restoration or environmental enhancement measures in three secondary channels of the Middle Mississippi River. The effort was achieved using micro modeling, a micro scale, physical sediment transport modeling methodology. This paper will outline the history of this environmental effort and describe the results of both model testing and recent construction implementation in the Mississippi River.

INTRODUCTION

In 1996, biologists and engineers from the United States Fish and Wildlife Service, the Illinois Department of Natural Resources, the Missouri Department of Conservation, and the St. Louis District Corps of Engineers, ventured on a joint environmental effort to improve riverine habitat conditions within four side channels of the Mississippi River. This effort was made possible by the authority of the St. Louis District Avoid and Minimize Environmental Program.

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The agencies assembled a team of experts to formulize ideas and strategies for the purpose of developing aquatic diversity in the Middle Mississippi River, at Sante Fe Chute, Mile 39 L, Picayune Chute, Mile 60.8 R, Schenimann Chute, Mile 62.2 L and Marquette Chute, Mile 51 L. Design alternatives were tested by the team in three micro models at the Applied River Engineering Center (AREC) in St. Louis, Missouri. The use of the micro models enabled the team to address the complex sediment transport interaction problem between the side channels and the main navigation channel of the Mississippi River. Team members assembled AREC on numerous occasions to jointly experiment with the micro models (Figure 1). Various alternatives that displayed promise in the models during team experiments where then studied in greater detail using the established micro modeling methodology. Comparisons were made to a model base condition, whereby the most feasible and cost effective design solution could be selected. Creating bathymetric variance and aquatic diversity was the primary goal of the team. Several different river engineering schemes were ultimately chosen for implementation in the Mississippi River. The team chose those alternatives that produced the most positive effects to the flow and streambed of the side channel. Construction costs were a major concern throughout the study. Also, particular attention was directed toward the integrity of the main navigation channel. Once a plan was chosen from model study results, river engineers then developed detailed construction plans and specifications.

SANTE FE CHUTE PROJECT

Sante Fe Chute is a particular side channel of the Mississippi River (Figure 2) that was of high priority by the restoration team. Various structural modifications to existing river training works as well as other ideas were tested in the model, including closure structure removal/modification, dredging, chevrons, and traditional dikes. The plan eventually chosen by the team encompassed an alternating dike scheme designed to create sinuosity in both the flow and sediment pattern of the side channel (Figures 3 and 4). Construction of the plan was initiated shortly after the model study in April of 1997 (Figure 5). Recent field monitoring of the plan in the river has

demonstrated that positive effects were developed after the first hydrographic event (Figure 6).

SCHENIMANN CHUTE – PICAYUNE CHUTE PROJECT

Schenimann Chute and Picayune Chute were two extremely narrow and long side channels (each less than 100 feet in width and approximately 5 to 8 miles in length, respectively). These channels were tested in the micro model (Figure 7) also in 1996. Plans developed through model tests are currently awaiting construction funding.

MARQUETTE CHUTE PROJECT

Marquette Chute was model tested in 1997. Results (Figure 8) indicated that a structural modification in the form of notches in an existing closure structure, in addition to dikes placed in the lower end off the side channel, would further increase the diversity of habitat and improve flow connectivity with the main channel.

CONCLUSIONS

Through the use of micro modeling, it was possible for a team of biologists and engineers to harmonically develop cost effective, reliable design solutions to side channel restoration projects on the Middle Mississippi River. The delicate balance of flow and sediment between the main channel and the side channels were for the first time visualized by use of the models. Hours spent together on the micro models provided an invaluable dialect and understanding among the interagency team members and set a precedence for future environmental engineering efforts on the river.

REFERENCES

Davinroy, Robert D., “Physical Sediment Modeling of the Mississippi River on a Micro Scale”, Thesis, University of Missouri - Rolla, Rolla, MO, 1994

U.S. Army Corps of Engineers, St. Louis District, Technical Report M1, “Sedimentation Study of the Mississippi River, Sante Fe Chute, Doolan Chute, Hydraulic Micro Model Investigation, St. Louis, MO, September 1996"

U.S. Army Corps of Engineers, St. Louis District, Technical Report M3, “Sedimentation Study of the Mississippi River, Marquette Chute, Hydraulic Micro Model Investigation, St. Louis, MO, December 1997"

LIST OF FIGURES